Hemorrhage of Late Pregnancy

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SUMMARY

Rupture of the uterus, cesarean section and uterine atony were the major causes of maternal death associated with hemorrhage of late pregnancy for the five years 1945 to 1949 in New York County. Shock occurred earliest in rupture of the uterus and cesarean section, while in uterine atony there was some delay before shock was evident. Placenta previa was preceded by an initial small hemorrhage, and the time interval before shock was relatively long. It appeared that in cases of retained placenta, manual removal of the organ and hysterectomy were unduly delayed. Ten per cent of the maternal deaths reviewed were associated with severe transfusion reactions. Early recognition of a serious situation, rapid blood replacement and hysterectomy might have salvaged most of the patients.

A MATERNAL death rate of considerably less than one per thousand was anticipated in the United States for the year 1950.[2] Many improvements and advances in the care of pregnant women have contributed to the reduced mortality rate. This represents the first time in medical history that a large country has been able to surpass the theoretical minimum. Not only should this low rate be maintained but such results should stimulate increased effort in this direction.

A study of the maternal mortality for New York City with its heterogeneous population shows that the major causes of death remain infection, toxemia and hemorrhage. In contrast to the pronounced decrease in deaths (Chart 1) due to puerperal infection, there has been relatively little change in the number of deaths due to toxemia and hemorrhage. Indeed, it appears that hemorrhage[3] outranks all other single causes of maternal deaths in the United States today. The work of several maternal welfare committees indicates that probably more than 75 per cent of hemorrhagic deaths are preventable. Therefore, in order to further reduce maternal mortality, the prevention, control and treatment of hemorrhage must be improved.

It occurred to the authors that a detailed study of maternal deaths resulting from hemorrhage might provide valuable and useful information pertaining

to etiologic factors and problems in management. Obviously, the data subjected to analysis should be of recent origin when all of the present therapeutic armamentaria were available. No single institution has accumulated a sufficiently large clinical experience of this kind during the past five years. Accordingly, reports of 50 cases in which maternal death was associated with late obstetric hemorrhage were taken from the files of the New York County (Borough of Manhattan) Maternal Welfare Committee. The deaths occurred in the five-year period 1945-49. The Maternal Welfare Committee collected detailed information from the physicians and hospitals concerned. It is the purpose of this report to analyze the chief cause of hemorrhage, the time of shock, the amount and speed of blood replacement, and any other treatment. In addition a summary will be given of the plan to combat hemorrhage in operation at The New York Lying-In Hospital. The results obtained during the same period will be cited. Recommendations will be advanced in the light of this experience with the hope that other unfortunate circumstances may be avoided in the future.

The causes of maternal death from late hemorrhage in the cases reviewed are shown in Table 1.

UTERINE RUPTURE

In the 13 cases in which maternal death was associated with rupture of the uterus, nine of the infants were deadborn and four were living. There were six instances of disproportion of some degree which included hydrocephalus, difficulty with the aftercoming head and attempted version after attempt to deliver with forceps had failed. Two maternal deaths resulted from rupture at the site of previous uterine

CHART 1

1945-1949 N.Y. City—Maternal Mortality
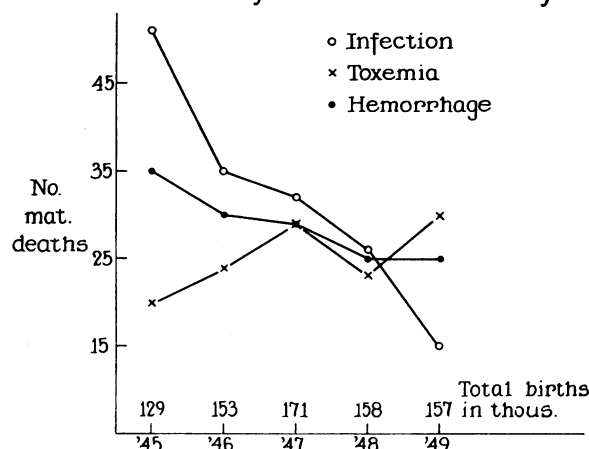
o Infection
× Toxemia
• Hemorrhage

No. mat. deaths

Total births in thous.

TABLE 1.—*Causes of 50 Deaths from Hemorrhage,
New York County, 1945-1949*

Rupture of uterus	13
Atony of uterus	12
Following cesarean section	8
Placenta previa	5
Trauma and retained placenta	6
Premature separation of placenta	4
Other	2
Total	50

scars. In two other instances the uterus apparently was ruptured during the process of manually removing the placenta. In one case, rupture occurred during induction of labor following the administration of Pitocin® intramuscularly. Rupture of the lateral wall of the uterus followed during the rapid labor and the birth of an 8-pound stillborn infant. The uterus was ruptured in another patient with placenta previa while internal podalic version was being carried out. In one case there was spontaneous rupture at term associated with the delivery of a well infant. Some brief comment with respect to the management of these patients with rupture of the uterus follows:

In three cases, the initial shock and hemorrhage were overcome, but secondary complicating factors (blood incompatibility, massive pulmonary atelectasis and peritonitis) resulted in death. Shock occurred extremely early and was often the first important clinical finding in conjunction with vaginal bleeding and abdominal pain. In eight cases, an hour or less elapsed before shock occurred. In one-half of the patients blood was not available until shock supervened. The blood loss was difficult to estimate but was thought to vary between 500 cc. and 3,000 cc. It is probable that in most instances the actual loss was considerably in excess of these figures. Blood replacement was carried out in nine cases: 2,000 cc. was given in two instances, 1,500 cc. in three, and 500 cc. in four. In two cases the uterus was packed without recognition that rupture had occurred, and in three cases hysterectomy was done as a last desperate measure with the patient in profound shock. It is apparent from these data that in most instances complicating factors which should have dictated preparations for transfusion were present. It is particularly striking that of the 15 patients with hemorrhage and shock, four were given only 500 cc. of blood and four were given no real supportive treatment.

UTERINE ATONY

In the 12 cases of postpartum uterine atony, all infants but one were born alive. The highest parity in this group was four. The pregnancies and deliveries were uncomplicated and there was nothing unusual in previous obstetrical histories. (In striking contrast, in the other cases detailed in Table 1 the complications were recognized and an opportunity provided for consultation and expert care.) In the cases of uterine atony the average blood loss was

estimated to be 2,500 cc. and the replacement was only 750 cc. In one instance, blood was administered 15 minutes after the onset of hemorrhage. However, the total amount given was only 1,000 cc. (total loss 3,000 cc.) and the patient died in three hours. On the average, however, blood replacement was not started until 1½ hours after the onset of hemorrhage. The largest amount of blood received was 4,000 cc. Two patients received no blood. In five instances, the uterus was packed with gauze—in four cases within 20 minutes and in one after three hours. At no time did the packing even temporarily appear to control the bleeding. In two cases, hysterectomy was performed late with the patients in poor condition. Hysterectomy was contemplated in the remainder but was not carried out because of inadequate blood supplies and deep shock. The average time factors in postpartum uterine atony indicated that shock occurred within two hours and death about one hour later (Chart 3).

CESAREAN SECTION

Eight maternal deaths were directly associated with cesarean section. In this group, seven infants were well and one died of hydrocephalus. In four cases the operation was an uncomplicated elective repeat procedure, while in three instances it was associated with labor and disproportion. In one case the operation was done because of history of adherent placenta in a previous pregnancy. A severe puerperal infection developed in one case and on the 32nd postpartum day hemorrhage occurred. (In all calculations of average time, this case was excluded.) The average blood loss in the cases in which death occurred following cesarean section was estimated at 3,000 cc. It is of interest that in five cases, only one unit of blood was available, and on one occasion no blood could be obtained. In this group of six patients for whom there was not adequate blood for transfusion shock occurred in one hour and death in two hours. The remaining two patients received larger quantities of blood and death occurred after a longer interval. On two occasions hysterectomy was carried out immediately following cesarean section because of uncontrolled hemorrhage.

PLACENTA PREVIA

Four maternal deaths were associated with placenta previa. Three living infants were delivered by low flap section and one was delivered deadborn through the normal birth passages. In all cases, two episodes of bleeding could be distinguished. The first was mild and the second fatal. Adequate blood was available in only one instance, and then transfusion was not started until two hours after the onset of hemorrhage. In one case hysterectomy was carried out after shock had occurred. In two cases the uterus was packed in the course of cesarean section without effective hemostasis. The average interval before shock was four and one-half hours—adequate time for securing necessary blood supplies in most circumstances.

TRAUMA

Multiple attempts at high forceps delivery and failure to recognize traumatic injury and associated blood loss resulted in three maternal deaths. All infants were deadborn. Blood was not administered and no attempt at repair was made until after the development of deep shock. The absence of adequate supportive measures, especially blood transfusions, is particularly striking in this group.

RETAINED PLACENTA

In three instances the placenta could not be expressed following uncomplicated delivery, and several attempts (manual) were necessary before the complete removal of the placenta was accomplished. Blood was not made available for transfusion. In one instance, the uterus was packed while the placenta was in place. In another, inversion of the uterus was not adequately treated. Despite bleeding, shock and an average duration of five hours for the third stage of labor, hysterectomy was not done nor was blood given in any case.

PREMATURE SEPARATION

In two of the four cases in which death was associated with premature separation of the placenta, delivery was by the vaginal route. One patient died three days and the other nine days following transfusion reaction. In the other two instances, concealed hemorrhage occurred. Not until an hour after the onset of hemorrhage was blood available for transfusion, and then only one unit in each case. Cesarean section was done in both cases; shock occurred during the operation and in each case the patient died shortly after the completion of the procedure. Two of the four patients were found to have a classical Convelaire type of uterus. The average blood loss was estimated at 2,000 cc. The two patients who died after operation received one unit of blood each, while the two with transfusion reactions were given four units each. In the only case in which hysterectomy was done the bleeding was controlled but the patient died on the third day as a result of severe transfusion reaction.

Chart 2 shows data pertaining to the time and amount of blood administered correlated with the

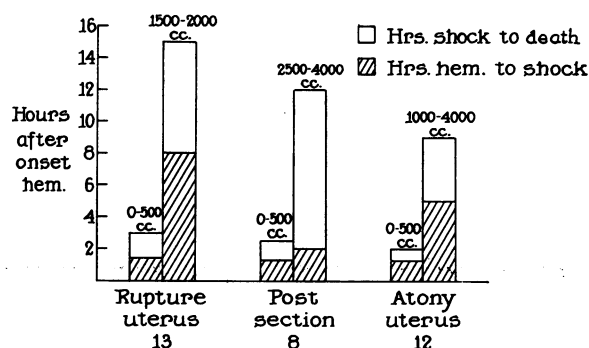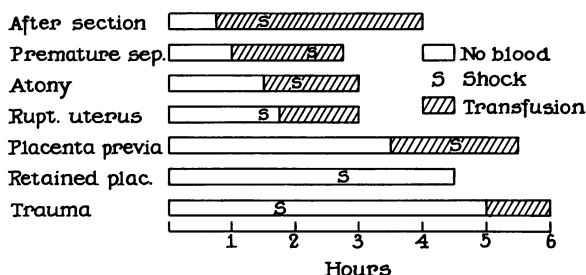### CHART 2

1945-1949   N.Y. County – Blood Replaced

CHART 3

1945-1949   N.Y. County–Hemorrhagic Deaths

clinical course of the three major causes of hemorrhagic death. If no blood or only a single unit was available, shock intervened within one or two hours and death followed one hour later. If 1,000 to 4,000 cc. of blood was administered, shock occurred in from two to eight hours and death followed from five to ten hours later. In the cases in which such large volumes of blood were given, severe shock usually had been present too long and was irreversible; the blood served only to prolong life for a short time.
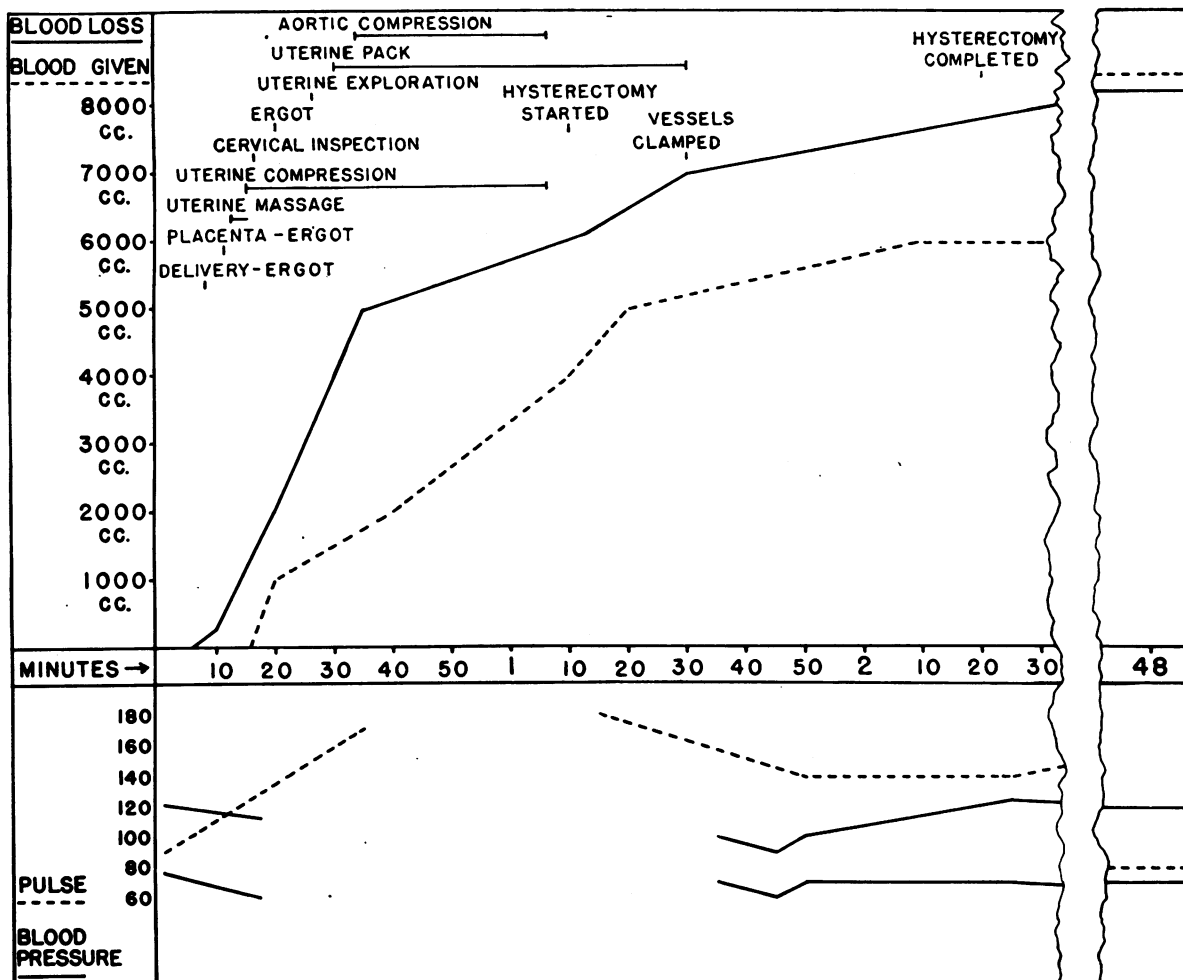
DISCUSSION

Chart 3 indicates the average time relationships between the onset of hemorrhage, shock, initial transfusion and death for each group previously discussed. In the cesarean section group one unit of blood was provided in every case, apparently because most operations are performed with at least one unit of blood available in the operating room. In those cases, moreover, in order that no time might be lost if blood should be needed, a needle for infusion was already in place in a vein in an extremity. The difficulty arose when no further blood could be obtained and shock occurred before additional supplies were available. Reliance upon a single unit of blood to combat hemorrhage complicating cesarean section was largely responsible for the deaths. The importance of careful observation for the first hour following operation is clearly demonstrated.

Shock occurred early in rupture of the uterus and in several instances it was the most significant initial clinical finding. The large loss of blood was often partially concealed in the broad ligament or in the peritoneal cavity. Prompt diagnosis and operation within the first hour after rupture with adequate blood transfusion and other supportive measures might well have averted disaster in all instances. With one exception, the patients had complications and difficulty in delivery which could have been predicted. In uterine atony, on the other hand, the hemorrhage could not be anticipated and bleeding did not start until the third stage of labor. Pregnancy and labor were usually normal.

The first abnormality in uterine atony consists of excessive loss of blood, and the cause usually can be determined by examining the fundus of the uterus. In these circumstances, it is essential for the well-being of the patient that procedures aimed

CHART 4

BLOOD LOSS		
BLOOD GIVEN		

AORTIC COMPRESSION
UTERINE PACK
UTERINE EXPLORATION   HYSTERECTOMY
ERGOT   STARTED   VESSELS
CERVICAL INSPECTION   CLAMPED
UTERINE COMPRESSION
UTERINE MASSAGE
PLACENTA - ERGOT
DELIVERY - ERGOT

HYSTERECTOMY
COMPLETED

8000 CC.
7000 CC.
6000 CC.
5000 CC.
4000 CC.
3000 CC.
2000 CC.
1000 CC.

MINUTES →   10 20 30 40 50 1 10 20 30 40 50 2 10 20 30   48

180
160
140
120
100
80
PULSE   60
BLOOD
PRESSURE

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to control the hemorrhage and to replace the blood lost be performed rapidly. These measures should be carried out simultaneously (rather than in sequence as happened in so many of the cases here reviewed). Following is a report of severe unanticipated uterine atony to illustrate the appropriate and extreme measures often required.

CASE REPORT

The patient was a 36-year-old, para 2, gravida 2. The antepartum course was complicated by mild hypertensive disease. Two days after the expected date of confinement, the membranes ruptured spontaneously and labor ensued. Four and one-half hours later, at 2:25 a.m., the patient was delivered spontaneously of a full term, living child under local anesthesia. Two minutes later, the placenta was expressed spontaneously and intact. Profuse hemorrhage began immediately. The usual oxytocics and massage were of no avail. From two antecubital sites rapid, massive transfusion therapy was started within five minutes after the onset of hemorrhage. The cervix and uterus were both intact. A uterine pack did not lessen the bleeding. Combined uterine and aortic compression greatly reduced the rate of blood loss. It was felt that the problem was one of uncontrollable

uterine atony and preparations were begun for hysterectomy. The patient's course and the therapy during the first critical hours are shown in Chart 4. It will be noted that the patient received almost nine units (550 cc. each) of citrated blood in the first hour following the initial hemorrhage. It was estimated that the total amount of blood lost was 8,200 cc., and during treatment 9,350 cc. of citrated whole blood was administered. The packed red cell volume dropped from a predelivery level of 38 per cent of the whole blood to a low of 28 per cent in the postpartum period. In addition there was a moderate depression of the calcium content of the blood. The patient had low grade, unexplained fever for one week. She was discharged as well on the 14th postpartum day.

The delayed onset of shock in placenta previa is striking as compared to the time interval in premature separation of the placenta (Chart 3). In placenta previa there was usually an initial short forewarning episode of bleeding which permitted time to make transfusion arrangements. In premature separation, shock was more rapid in onset, as in rupture of the uterus. The deaths from retained placenta and trauma during vaginal delivery all re-

sulted from errors in judgment and treatment in addition to the late and limited use of blood. When large quantities of blood are poured into the circulation, transfusion reactions are somewhat more likely to occur. Very often in these circumstances, the use of multiple types of blood becomes necessary, which further increases the chance of reaction. The importance of careful and rapid blood compatibility tests is illustrated by the fact that 10 per cent of the deaths were associated with the secondary complication of bilateral hemoglobin nephrosis. Adherence to accepted standard procedures would probably have eliminated these unfortunate results.

The analysis of these hemorrhagic disasters points out clearly some definite implications. In retrospect, the large majority of deaths appeared to be preventable. Failure to save the patient's life could be traced usually to poor appreciation of the seriousness of the situation, optimistic estimates of blood loss, reluctance or inability to begin transfusion therapy immediately, inadequate blood replacement, and late surgical intervention.

The efforts of the staff of The New York Lying-In Hospital to overcome the problem of hemorrhage have been described elsewhere in detail.[1] The preparations prior to and at the time of hemorrhage which have been used with very satisfactory results are as follows:

1. The blood group and the Rh factor are determined at the time of the first antepartum visit.

2. Blood is available in the operating or delivery room for midforceps delivery, cesarean section, manual removal of the placenta or other major obstetrical operation.

3. Hemorrhage may occur more frequently in other circumstances such as multiple pregnancy,

excessive sized infants, vulval varicosities, myoma uteri, and deep anesthesia. Appropriate measures may be adopted according to the complication.

4. Although a large general blood bank may be available, an additional obstetric blood bank on the delivery floor, containing type O Rh negative blood treated with Witebsky[4] substance, is of inestimable value and makes possible the initiation of blood restoration in a matter of minutes.

5. Blood may be given rapidly under pressure (120 mm. of mercury) with large bore needles (No. 15).

6. A critical time factor after the onset of hemorrhage is important in massive obstetric hemorrhage. Studies indicate that rapid transfusion therapy must be commenced within minutes after massive hemorrhage if the patient's life is to be saved.

This outlines the policy which with minor variations, has been carried out since 1944. In 28,000 deliveries at the New York Lying-In Hospital from 1944 through 1949, only one private obstetrical patient died of hemorrhage, and there were no deaths from hemorrhage in 16,000 gynecologic operations.

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